UNITED STATES PATENT AND TRADEMARK OFFICE

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	10/797,635	RIDGE ET AL.
	Examiner	Art Unit	
	Christopher Findley	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>22 October 2007</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-17, 20-23, 25 and 27-30* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-17, 20-23, 25, and 27-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1.   The Examiner notes that the Applicant has cancelled claims 1, 2, 18, 19, 24, and

26, and amended claims 3, 4, 6, 8, 15, 20-23, 25, and 27-30 via the Amendment filed

10/22/2007.

Response to Arguments

2.   Applicant's arguments with respect to claims 4 and 21 have been considered but

are moot in view of the new ground(s) of rejection.

3.   A modified copy of the previous Office Action, reflecting changes made to the

claims via the Amendment filed 10/22/2007, is included below.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
>
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
>
> the prior art are such that the subject matter as a whole would have been obvious at the time the
>
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
>
> Patentability shall not be negatived by the manner in which the invention was made.

5.   Claims 3-7, 9-17, 20-23, 25, and 27-30 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Koto et al. (US 20030215014) in view of Kato et al. (US

6151360 A).

Re **claim 4**, Koto discloses a method, comprising: selecting M reference frames

for a given original video frame from a video sequence having a plurality of video

frames, each frame containing a plurality of coefficients, wherein M is a positive integer

greater than 1 (Koto: Fig. 11); partitioning said original video frame into rectangular

blocks of coefficients (Koto: Abstract section); and from each of the M reference frames:

forming at least one reference block of coefficients from an offset of the rectangular

blocks (Koto: Fig. 12, the frames are partitioned into blocks and motion vectors indicate

offsets); and obtaining a block difference at least partially based on a summation of

differences between corresponding individual coefficients in each of said rectangular

blocks of coefficients and said at least one reference block of coefficients (Koto: Fig.

33); and optimizing the offset at least partially based on the block difference (Koto:

paragraph [0146]). Koto does not specifically disclose using the absolute values of the

differences between corresponding individual coefficients in each of said rectangular

blocks of coefficients and said at least one reference block of coefficients. However,

Kato discloses a method for encoding a video signal using statistical information,

wherein the sum of absolute values of inter-picture residuals is among the different sorts

of information on picture characteristics used in the picture analysis (Kato: column 16,

lines 20-34). Since both Koto and Kato relate to coding video sequences with motion

information, one of ordinary skill in the art at the time of the invention would have found

it obvious to combine the sum of absolute differences calculation of Kato with the coding

method of Koto in order to maximize the accuracy of the motion information, thus

improving coding accuracy and rendering image noise less obtrusive (Kato: column 1,

line 64, through column 2, line 3). The combined system of Koto and Kato has all of the

features of claim 4.

Re **claim 3**, Koto discloses that for each of said rectangular blocks of coefficients

and each permutation of a horizontal offset value X and a vertical offset value Y,

obtaining M additional rectangular blocks of coefficients for providing M reference

blocks, wherein each of said M reference blocks of coefficients is formed by selecting

coefficients from the M reference frames, such that the coefficients in the M reference

blocks of coefficients are horizontally offset by distance X and vertically offset by

distance Y from a corresponding coefficient in said rectangular block of coefficients

(Koto: paragraph [0146], candidate motion vectors are scaled according to inter-frame

distance, leaving only a 2-dimensional (x, y) offset).

Re **claim 5**, Koto discloses for each of said rectangular blocks of coefficients,

determining an optimal horizontal offset X and vertical offset Y, wherein said

determining is based at least partially on minimizing a weighted sum of M block

differences (Koto: paragraph [0013]).

Re **claim 6**, Koto discloses that each of the M video frames selected as the M

reference frames is computed based on the same frame of original video (Koto: Fig.

12).

Re **claim 7**, Koto discloses that the block differences for the M reference blocks

are combined for providing a weighted sum having a plurality of weighting factors, and

wherein each weighting factor in the weighted sum is determined at least partially based

upon a quantizer parameter or the index of the reference frame subjected to that weight

(Koto: paragraphs [0081]-[0084]).

Re **claim 9**, the combined system of Koto and Kato discloses a majority of the

features of claim 9 as discussed in claims 4 and 5 above. Koto does not explicitly

disclose that motion is represented by a motion vector to be encoded in bits, and

wherein said determining is also based on the number of bits needed to encode the

motion vector. However, Kato discloses a method for encoding a video signal using

statistical information, where motion vector complexity and available bitrate are used as

factors in the coding process (Kato: Fig. 8; column 8, line 22, through column 9, line 13).

Since both Koto and Kato relate to coding video with motion information, one of ordinary

skill in the art at the time of the invention would have found it obvious to combine the

optimization method of Kato with the coding method of Koto in order to enhance coding

by rendering image noise less obtrusive (Kato: column 1, line 64, through column 2, line

3). The combined system of Koto and Kato has all of the features of claim 9.

Re **claim 10**, Koto discloses that the set of M reference frames is divided into N

sub-sets, such that each of the M reference frames belongs to precisely one of the N

sub-sets, and wherein the process of determining the optimal horizontal offset X and

vertical offset Y is repeated for each of said N sub-sets of reference frames, for

indicating a set of N optimal horizontal offsets X and N vertical offsets Y (Koto: Fig. 11,

MPEG may use a linear prediction scheme, allowing a group of pictures (GOP) may be

divided into subgroups).

Re **claim 11**, Koto discloses that said determining of the optimal horizontal offset

X and optimal vertical offset Y involves a discrimination against offsets with large

magnitudes (Koto: paragraph [0146], the minimum value is sought).

Re **claim 12**, Koto discloses that the discrimination is at least partially dependent

upon an index corresponding to which of the M reference frames is being considered

(Koto: paragraph [0146], candidate motion vectors are scaled according to inter-frame

distance).

Re **claim 13**, Koto discloses that the number N may vary from one frame of video

to another frame of video (Koto: Fig. 11, the number of reference frames may vary as

well as the number and type of frames in a GOP, allowing the number of subsets to vary

accordingly).

Re **claim 14**, the combined system of Koto and Kato discloses a majority of the

features of claim 14 as discussed in claims 4, 5 and 11 above, but neither Koto nor Kato

explicitly discloses that the number N may vary from one frame of video to another

frame of video, and the determination of the number N involves analysis of block

differences in the previous frame. However, the Examiner takes Official Notice that one

of ordinary skill in the art at the time of the invention would have found it obvious that a

scene change may truncate a GOP, as is well known for instance to implement frame

dropping rate control, therefore causing the GOP to contain less reference frames than is typical.

Re **claim 15**, Koto discloses that for each rectangular block, the set of M reference blocks is divided into N sub-sets, such that each of the M reference blocks belongs to precisely one of the N sub-sets, and wherein the process of determining the optimal horizontal offset X and vertical offset Y is repeated for each of said N sub-sets of reference blocks, for indicating a set of N optimal horizontal offsets X and N vertical offsets Y (Koto: Fig. 11, MPEG may use a linear prediction scheme, allowing a group of pictures (GOP) may be divided into subgroups, and, in turn, dividing the number of reference blocks as well).

Re **claim 16**, Koto discloses that the number N of sub-sets may vary from one block to another within the given frame of video, said variation either based upon explicit signaling in the encoded bit stream or upon a deterministic algorithm (Koto: Fig. 11, the number of reference frames (explicitly indicated by the Code_number) may vary as well as the number and type of frames in a GOP, allowing the number of subsets to vary accordingly).

Re **claim 17**, the combined system of Koto and Kato discloses a majority of the features of claim 17 as discussed in claims 4 and 15-16 above, but neither Koto nor Kato explicitly discloses that the size of a rectangular block in one of the N sub-sets is computed at least partially using the size of a rectangular block in another of the N sub-sets or the values of the horizontal offsets X and vertical offsets Y. However, the

Examiner takes Official Notice that one of ordinary skill in the art at the time of the

invention would have found it obvious that a search block in a reference frame typically

occupies an area that is a multiple of the size of the target block, as is well known.

Claim 20 has been analyzed and rejected with respect to claim 3 above.

Re **claim 21**, Koto discloses an encoder, comprising: a motion estimation

module, responsive to an input signal indicative of an original frame in a video

sequence, for providing a set of predictions so as to allow a prediction module to form a

predicted image, wherein the video sequence including a plurality of video frames, each

frame containing a plurality of coefficients at different locations of the frame (Koto: Fig.

1, element 119); and a combining module, responsive to the input signal and the

predicted image, for providing residuals for encoding (Koto: Fig. 1, element 119),

wherein the motion estimation block is configured for selecting M reference frames for a

given original video frame in said plurality of video frames, wherein M is a positive

integer greater than 1 (Koto: Fig. 11); partitioning said original video frame into

rectangular blocks of coefficients (Koto: Abstract section); and from each of the M

reference frames: forming at least one reference block of coefficients from an offset of

the rectangular blocks (Koto: Fig. 12, the frames are partitioned into blocks and motion

vectors indicate offsets); and obtaining a block difference at least partially based on a

summation of differences between corresponding individual coefficients in each of said

rectangular blocks of coefficients and said at least one reference block of coefficients

(Koto: Fig. 33);and optimizing the offset at least partially based on the block difference

(Koto: paragraph [0146]). Koto does not specifically disclose using the absolute values

of the differences between corresponding individual coefficients in each of said

rectangular blocks of coefficients and said at least one reference block of coefficients.

However, Kato discloses a method for encoding a video signal using statistical

information, wherein the sum of absolute values of inter-picture residuals is among the

different sorts of information on picture characteristics used in the picture analysis

(Kato: column 16, lines 20-34). Since both Koto and Kato relate to coding video

sequences with motion information, one of ordinary skill in the art at the time of the

invention would have found it obvious to combine the sum of absolute differences

calculation of Kato with the coding method of Koto in order to maximize the accuracy of

the motion information, thus improving coding accuracy and rendering image noise less

obtrusive (Kato: column 1, line 64, through column 2, line 3). The combined system of

Koto and Kato has all of the features of claim 21.

Claim 22 has been analyzed and rejected with respect to claim 5 above.

Claim 23 recites the corresponding computer program for implementing the

method of claim 4, and, therefore, has been analyzed and rejected with respect to claim

4 above.

Claim 25 has been analyzed and rejected with respect to claim 3 above.

Claim 27 has been analyzed and rejected with respect to claim 5 above.

Claim 28 has been analyzed and rejected with respect to claim 7 above.

Claim 29 has been analyzed and rejected with respect to claim 10 above.

Claim 30 has been analyzed and rejected with respect to claim 15 above.

6.   Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koto et al. (US 20030215014) in view of Kato et al. (US 6151360 A), as applied to claims 3-7, 9-17, 20-23, 25, and 27-30, and further in view of Wu et al. (US 6700933 B1).

Re claim 8, the combined system of Koto and Kato discloses a majority of the features of claim 8 as discussed in claim 4 above, but neither Koto nor Kato explicitly discloses that each of the M video frames selected as the M reference frames is computed by decoding the same frame of original video at a variety of quality settings. However, Wu discloses a method with advance predicted bit-plane coding for progressive fine-granularity scalable (PFGS) video coding, where different layers are used for different quality of video (Wu: Fig. 23). Since Koto and Wu both employ motion estimation/compensation (Koto: Abstract section; Wu: Fig. 19, elements 204, 206, and 207), one of ordinary skill in the art at the time of the invention would have found it obvious to combine the bit-plane coding of Wu with the combined system of Koto and Kato in order to provide a robust coding scheme which adapts to bandwidth fluctuation and also exhibits good error recovery characteristics (Wu: column 3, lines 27-29). The combined system of Koto, Kato, and Wu has all of the features of claim 8.

Conclusion

7.   The prior art made of record and not relied upon is considered pertinent to

applicant's disclosure:

    a.   Multiple frame motion estimation

Lavagetto et al. (US 5151784 A)

    b.   Multi-hypothesis motion-compensated video image predictor

Wiegand et al. (US 6807231 B1)

    c.   Method and apparatus for weighted prediction estimation using a

displaced frame differential

Yin et al. (US 20060198440 A1)

8.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Findley whose telephone number is (571) 270-1199. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha D. Banks-Harold can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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